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PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

04/12/2004 YPOLITE1 00000002 500220 10820605

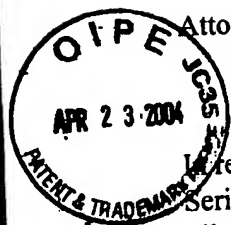
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02 FC:1202	72.00 DA
03 FC:1201	86.00 DA
04 FC:1203	290.00 DA

Adjustment date: ~~06/04/2004~~ EEKUBAY1
~~04/12/2004 YPOLITE1 00000002 500220 10820605~~
03 FC:1201 86.00 CR

06/04/2004 EEKUBAY1 00000002 500220 10820605

01 FC:1202 18.00 DA

PTO-1556
(5/87)



Attorney's Docket No. 9363-4 2004 APR 27 PM 4:00

Dep of Ref R-307
STATUS AND
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Liu et al.

Serial No.: 10/820,605

Filed: April 8, 2004

For: *Color-developing Agent Resin Composition, Emulsion Thereof and Method for Preparing the Same*

Date: April 21 2004

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

**REQUEST FOR REFUND OF FEE
UNDER 37 C.F.R. §1.26**

Sir:

Applicants respectfully submit this Request for Refund of Fees pursuant to 37 C.F.R. §1.26 in the amount of \$376.00. On April 8, 2004, Applicants filed the application, Preliminary Amendment, and Cover Sheet for Filing Utility Patent Application (37 CFR §1.53(b) with the US Patent and Trademark Office (USPTO). The Cover Sheet indicated the total claims to be 24 total claims and 3 independent claims. The preliminary amendment removed all claim dependencies. A copy of the Cover Sheet as filed and a clean version of the claims are enclosed for your reference. A check in the amount of \$842.00 (copy enclosed) was enclosed with the application. This included the large entity fee of \$770.00 plus \$72.00 for 4 additional claims.

Deposit Account 50-0220 was overcharged on April 12, 2004, in the amount of \$376.00 (\$86.00 for additional independent claims and \$290.00 for multiple dependent claims). Please see highlighted entry on enclosed Deposit Account Statement. As evidenced by the claim set included with this request, Applicants submit that there are only 3 independent claims and (0) zero multiple dependent claims. Applicants submit that this charge was made in error as the filing fee for additional claims was previously paid.

Accordingly, please credit our Deposit Account No. 50-0220 in the amount of \$376.00 to refund this overpayment of fees.

Respectfully submitted,

Jarett K. Abramson
Registration No. 47,376

In re: Liu et al.
Serial No.: 10/820,605
Filed: April 8, 2004
Page 2

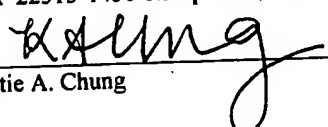
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2004 APR 27 PM 4:00

Customer No. 20792
Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401

Certificate of Mailing under 37 CFR 1.8 (or 1.10)

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on April 21, 2004.


Katie A. Chung



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ATTY DOCKET NO.: 9363-4

DATE: April 8, 2004

**UTILITY PATENT APPLICATION TRANSMITTAL LETTER
AND FEE TRANSMITTAL FORM (37 CFR § 1.53(b))**

Mail Stop PATENT APPLICATION
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

COPY

Sir:

Transmitted herewith for filing under 37 CFR § 1.53(b) is:

- ☒ a patent application
☐ a Continuation ☐ a Divisional ☐ a Continuation-in-Part (CIP) Application of prior application no.: _____; filed _____, the disclosure of which is incorporated herein by reference in its entirety.
☐ and claims the benefit of Provisional Application No. _____; filed _____.

Inventor(s) or Application Identifier:

Zonglai Liu - Xinxiang City, China
Chunxuan Guo - Xinxiang City, China
Wei Zhang - Xinxiang City, China
Yuzhu Liu - Xinxiang City, China

Entitled: COLOR-DEVELOPING AGENT RESIN COMPOSITION, EMULSION THEREOF AND METHOD FOR PREPARING THE SAME

Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428

Raleigh, North Carolina 27627

Telephone: (919) 854-1400

Facsimile: (919) 854-1401

Customer No. 20792

Enclosed are:

1. ☒ Application Transmittal Letter and Fee Transmittal Form (*A duplicate is enclosed for fee processing*)
2. ☒ 18 pages of Specification (including 22 claims)
3. ☐ 0 sheets of Formal Drawings (35 USC 113)
4. ☐ Oath or Declaration
 - a. ☐ newly executed (*original or copy*)
 - b. ☐ copy from prior application (37 CFR 1.63(d) (*for continuation/divisional*) [Note Box 6 Below])
 - c. ☐ **DELETION OF INVENTOR(S)** (*Signed statement deleting inventor(s) named in the prior application*)
5. ☐ Application Data Sheet. See 37 CFR 1.76
6. ☐ Incorporation By Reference (*useable if box 4b is checked*)

The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
7. ☐ Microfiche Computer Program (*Appendix*)

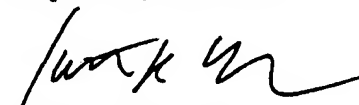
8. ☐ Assignment papers (cover sheet(s) and document(s))
9. ☐ Applicant claims small entity status. See 37 CFR § 1.27.
10. ☐ Information Disclosure Statement, PTO-1449, and ___ references cited
11. ☒ Preliminary Amendment (*Please enter all claim amendments prior to calculating the filing fee.*)
12. ☐ English Translation Document
13. ☐ Certified Copy of Priority Document No.; Filed:
14. ☐ Sequence Listing/ Sequence Listing Diskette
- a. ☐ computer readable copy
- b. ☐ paper copy
- c. ☐ statement in support
15. ☐ An Associate Power of Attorney
16. ☒ Return Receipt Postcard (MPEP 503) (*Should be specifically itemized*)
17. ☐ Deletion of Inventors(s) (*Signed statement attached deleting inventor(s) name in the prior application. See 37 CFR 1.63(d)(2) and 1.33(b).*)
18. ☐ Nonpublication Request under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form.
19. ☒ Other: Application Filed Under 37 CFR 1.41(c)

The fee has been calculated as shown below:

	Column 1 No. Filed	Column 2 No. Extra	Small Entity Rate Fee	Large Entity Rate Fee
BASIC FEE			\$385.00	\$ 770.00
TOTAL CLAIMS	24- 20 =	4	x 09 = \$	x 18 = \$72.00
INDEP CLAIMS	3- 3 =	0	x 43 = \$	x 86 = \$
<input type="checkbox"/> MULTIPLE Dependent Claims Presented			+ 145 = \$	+ 290 = \$
<i>If the difference in Col. 1 is less than zero, Enter "0" in Col. 2</i>			Total \$	Total \$842.00

- ☐ A check in the amount of \$ to cover the filing fee is enclosed.
- ☐ A check in the amount of \$ is enclosed to cover the filing fee, PLUS the Assignment Recordation fee (\$40.00).
- ☒ Please charge my Deposit Account No. 50-0220 in the amount of \$842.00.
- ☒ The Commissioner is hereby authorized to credit overpayments or charge the following fees associated with this communication to Deposit Account No. 50-0220.
- a. ☒ Additional filing fees under 37 CFR 1.16 for presentation of extra claims.
- b. ☒ Additional patent application processing fees under 37 CFR 1.17.

Respectfully submitted,

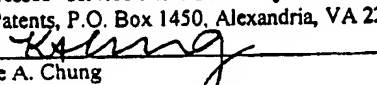


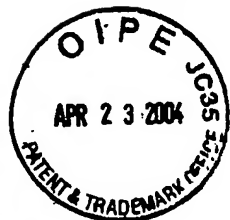
Jarett K. Abramson
Registration No. 47,376

CERTIFICATE OF EXPRESS MAILING

Express Mail Label No. EV 381441349 US
Date of Deposit: April 8, 2004

I hereby certify that this correspondence is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR § 1.10 on the date indicated above and is addressed to: Mail Stop PATENT APPLICATION, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450


Katie A. Chung

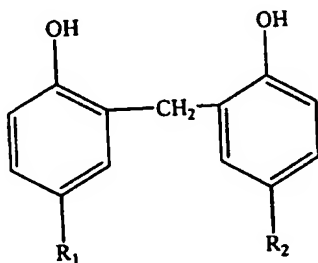


CLAIMS PENDING

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1. (previously presented) A color-developing agent resin composition comprising:

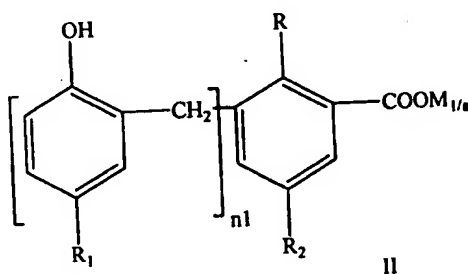
Component 1: a phenolic resin comprising formula I



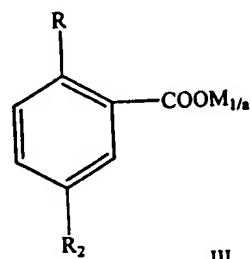
(I)

and

Component 2: a blend of graft copolymers of a phenolic resin and a multivalent metal salt polymer of a substituted aryl carboxylic acid, wherein at least a portion of said graft copolymers comprise formulas II and III



II



III

wherein

R is C₁-C₄ linear alkyl, hydroxy or halogen;

R₁ is individually C₁-C₁₂ linear or branched alkyl, C₁-C₁₂ halohydrocarbyl, C₆-C₁₂ aryl, C₇-C₁₂ aralkyl;

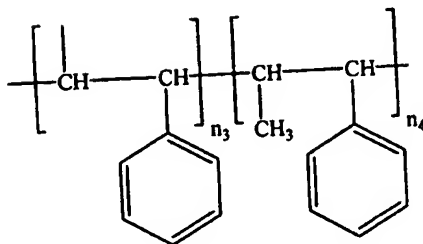
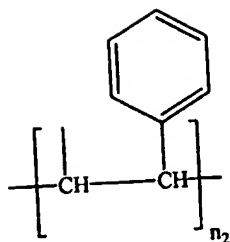
n₁ = 1-2

M is a multivalent metal ion;

a represents the valence of M; and

R₂ is

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wherein n_2 is an integer from 1–100; n_3 is an integer from 1–100; and n_4 is an integer from 1–100.

2. (previously presented) The color-developing agent resin composition of claim 1, wherein the content of the component 1 comprises about 5–50 % by weight, and component 2 comprises about 95–50 % by weight of the color-developing agent resin composition.

3. (previously presented) The color-developing agent resin composition of claim 1 or 2, wherein the content of the component 1 comprises about 10–30 % by weight, and the content of the component 2 comprises about 90–70 % by weight of the color-developing agent resin composition.

4. (previously presented) A color-developing agent resin emulsion comprising:
(1) the color-developing agent resin composition of claim 1; and
(2) an emulsifying agent.

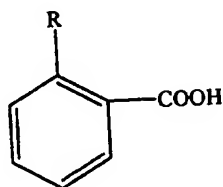
5. (previously presented) The color-developing agent resin emulsion of claim 4, wherein the emulsifying agent is selected from the group consisting of a surfactant, a modified starch and a polyvinyl alcohol.

Attorney Docket No. 9363-4
April 8, 2004

2004 APR 27 PM 4:00

6. (previously presented) A method for preparing the color-developing agent resin composition of claim 1 comprising:

(1) synthesizing the polymer of a substituted aryl carboxylic acid and an alkenyl benzene in the presence of a catalyst in an inert solvent by using a substituted aryl carboxylic acid or ester having a general formula (IV) and an alkenyl benzene as feedstocks, and reacting the polymer with a multivalent metal ion to form a multivalent metal salt polymer of substituted aryl carboxylic acid as an intermediate;



(IV)

wherein

R is C₁-C₄ linear alkyl, hydroxy or halogen;

(2) melting the mixture of a *p*-substituted phenol, the substituted aryl carboxylic acid or ester having a general formula (IV), a metal oxide and a catalyst, and reacting them to form a reaction product;

(3) adding the intermediate of step 1 to the reaction product of step 2, and reacting at about 80-150 °C for about 30-150 minutes to form a second reaction product;

(4) reacting the second reaction product of step 3 with an aldehyde under refluxing at about 80-130 °C for about 1-10 hours;

(5) dehydrating the product of step 4 at a temperature of about 90-150 °C under a vacuum at about 0.02-0.06 mPa to form a dehydrated product; and

(6) cooling the dehydrated product and milling the dehydrated product to produce a particle.

7. (previously presented) The method of claim 6, wherein:

(a) the molar ratio of the substituted aryl carboxylic acid to the *p*-substituted phenol in step 2 is about 0.05-1.55: 1 and the molar ratio of the metal oxide to the substituted aryl carboxylic acid is about 0.02-1.30: 1;

2004 APR 27 PM 4:00

STATUS AND
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- (b) the molar ratio of the metal salt of substituted aryl carboxylate to the *p*-substituted phenol in step 3 is about 0.05–5.0: 1; and
- (c) the molar ratio of the aldehyde to the *p*-substituted phenol in step 4 is about 0.06–2.0: 1.

8. (previously presented) The method of claim 6, wherein the inert solvent is selected from the group consisting of organochlorines, alcohols, ethers, and ketones.

9. (previously presented) The method of claim 8, wherein the inert solvent used is selected from the group consisting of chloroethane, dichloroethane, trichloromethane, methanol, ethanol, propanol, butanol, isopropanol, isobutanol, dipropyl ether, diisopropyl ether, dibutyl ether, diisoamyl ether, acetone, butanone, pentanone, hexanone, hexanedione, heptanone and cyclohexanone.

10. (previously presented) The method of claim 6, wherein the *p*-substituted phenol is selected from the group consisting of alkylphenol, arylphenol and aralkylphenol, or a mixture thereof.

11. (previously presented) The method of claim 10, wherein the *p*-substituted phenol used is selected from the group consisting of *p*-methylphenol, *p*-ethylphenol, *p*-propylphenol, *p*-butylphenol, *p*-tert-butylphenol, *p*-amylphenol, *p*-hexylphenol, *p*-heptylphenol, *p*-octylphenol, *p*-tert-octylphenol, *p*-nonylphenol, *p*-decylphenol, *p*-undecylphenol, *p*-dodecylphenol, *p*-chlorophenol, *p*-bromophenol, *p*-phenylphenol and *p*-phenylalkyl phenol, or a mixture thereof.

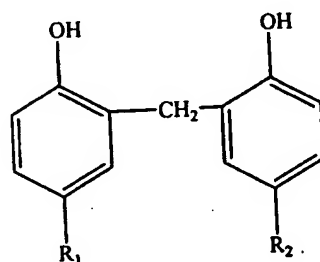
12. (previously presented) The method of claim 6, wherein the aldehyde is selected from the group consisting of formaldehyde, acetaldehyde, propionaldehyde, butyraldehyde, amylaldehyde and benzaldehyde.

13. (previously presented) The method of claim 6, wherein the aldehyde is formalin comprising about 37 % by weight to about 50 % by weight.

2004 APR 27 PM 4:01

Attorney Docket No. 9363-4
April 8, 2004

14. (previously presented) The method of claim 6, wherein the substituted aryl carboxylic acid is selected from the group consisting of C₁-C₄ linear alkylphenyl carboxylic acid, halophenyl carboxylic acid and salicylic acid, or an ester thereof.
15. (previously presented) The method of claim 6, wherein the metal oxide is an oxide of metal selected from the group consisting of Mg, Ca, Cu, Cd, Al, Zn, Cr, In, Sn, Co, Ni, Ti and Ba.
16. (previously presented) The method of claim 6, wherein the metal salt of substituted aryl carboxylic acid is zinc salt.
17. (previously presented) The method of claim 6, wherein the catalyst is an acidic or a basic catalyst, or a specified surfactant.
18. (previously presented) The method of claim 6, wherein the alkenyl benzene is selected from the group consisting of vinyl benzene, propenyl benzene, butenyl benzene, butadienyl benzene, isobutenyl benzene and cyclo-alkenyl benzene and the like.
19. (previously presented) A method for preparing a color-developing agent resin emulsion comprising:
- (1) a color-developing agent resin composition comprising:
- Component 1: a phenolic resin comprising formula I:

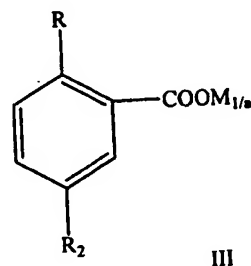
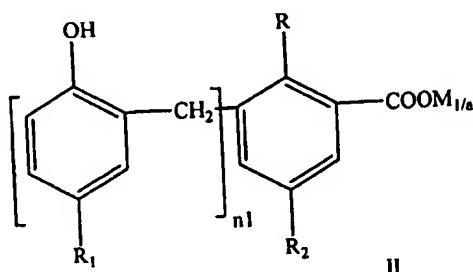


(I)

and

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Component 2: a blend of graft copolymers of a phenolic resin and a multivalent metal salt polymer of a substituted aryl carboxylic acid, wherein at least a portion of said graft copolymers comprise formulas II and III



wherein

R is C₁-C₄ linear alkyl, hydroxy or halogen;

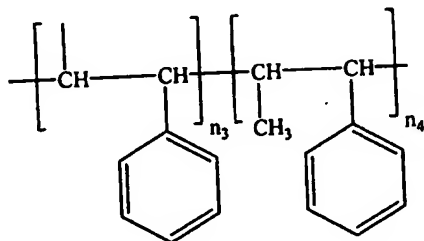
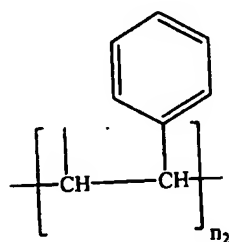
R₁ is individually C₁-C₁₂ linear or branched alkyl, C₁-C₁₂ halohydrocarbyl, C₆-C₁₂ aryl, C₇-C₁₂ aralkyl;

n₁ = 1-2

M is a multivalent metal ion;

a represents the valence of M; and

R₂ is



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wherein n_2 is an integer from 1-100; n_3 is an integer of 1-100; and n_4 is an integer of 1-100;
and

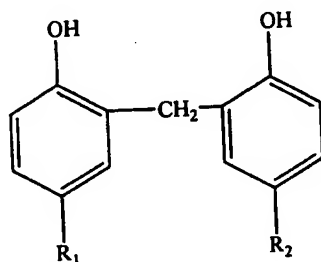
(2) an emulsifying agent,

wherein the color-developing agent resin composition is emulsified with the emulsifying agent in an emulsifying machine to obtain an oil-in-water emulsion with an average particle size of less than about $1.5\mu\text{m}$.

20. (previously presented) The method of claim 19, wherein the emulsifying agent comprises a surfactant, a modified starch or a polyvinyl alcohol.

21. (previously presented) A resin color-developing agent for no-carbon copying paper, wherein said resin color-developing agent comprises a color-developing agent resin composition comprising:

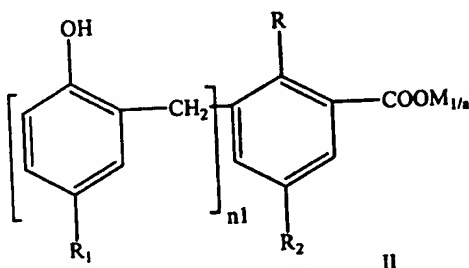
Component 1: a phenolic resin comprising formula I



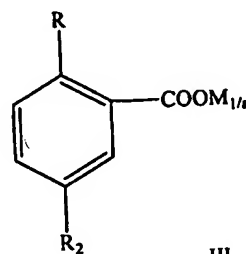
(I)

and

Component 2: a blend of graft copolymers of a phenolic resin and a multivalent metal salt polymer of a substituted aryl carboxylic acid, wherein at least a portion of said graft copolymers comprise formulas II and III



II



III

2004 APR 27 PM 4:01

wherein

R is C₁-C₄ linear alkyl, hydroxy or halogen;

R₁ is individually C₁-C₁₂ linear or branched alkyl, C₁-C₁₂ haloalkyl, C₆-C₁₂

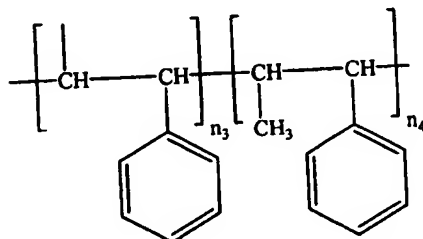
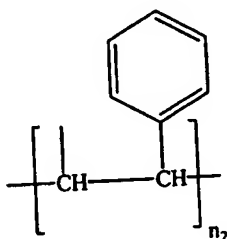
aryl, C₇-C₁₂ aralkyl;

n₁ = 1-2

M is a multivalent metal ion;

a represents the valence of M; and

R₂ is



wherein n₂ is an integer from 1-100; n₃ is an integer of 1-100; and n₄ is an integer of 1-100.

22. (previously presented) The color-developing agent of claim 21, further comprising an emulsifying agent, wherein the color-developing agent resin composition is emulsified with the emulsifying agent in an emulsifying machine to obtain an oil-in-water emulsion with an average particle size of less than about 1.5 μm .

23. (previously presented) The color-developing agent resin composition of claim 1, wherein n₂ is an integer from 1-10.

Attorney Docket No. 9363-4
April 8, 2004

STATUS AND
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24. (previously presented) The color-developing agent resin composition of claim 1, wherein n_3 is an integer from 1-10 and n_4 is an integer from 1-10. 2004 APR 27 PM 4:01

Deposit Account Statement

Page 3 of 3



STATUS AND ENTITY
COPY
201 APR 27 PM 4:01

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04/14 487	6306612	90228	8021	\$40.00	\$41,635.00
04/15 377	PCT/US04/11224	9389.2.WO	1703	\$85.00	\$41,550.00
04/15 379	PCT/US04/11224	9389.2.WO	8007	\$20.00	\$41,530.00
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04/16 17	6627617		9204	-\$100.00	\$39,372.00
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04/20 250	60471664	9070-12PR	8021	\$40.00	\$38,512.00
04/20 276	PCT/US04/11661	208.6174.WO	1602	\$700.00	\$37,812.00

START	SUM OF	SUM OF	END
BALANCE	CHARGES	REPLENISH	BALANCE
\$42,627.00	\$32,165.00	\$27,350.00	\$37,812.00

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